KAYA INSTRUMENTS

Komodo II CLHS

Komodo II CLHS
Frame Grabber with Four Channels

Innovative Approach

The **Komodo II CLHS** is a high-performance Camera Link HS Frame Grabber supporting the CLHS X Protocol (10G) standard. The Komodo II CLHS is capable of receiving video streams using four SFP+ 10Gbps optical transceivers interface, with each link supporting standard X Protocol bitrates of up to 10 Gbps.

The board offers a flexible DDR4 memory system and up to 40 Gbps through optical interfaces. A high speed 8 lane Gen 3.0 PCI express interface allows fast data transfer between optical links and computer memory. A GPIO connector enables machine control signals such as triggers, timers, shaft-encoders, exposure-control and general I/O along with video stream acquisition.

Intelligent Design

All of these features make the Komodo II CLHS Frame Grabber ideal for a wide range of applications, including network processing and security, compute and storage, instrumentation, broadcast, defense and aerospace.

Key Features:

- 4 x SFP+ channels at 10 Gbps each
- PCIe Gen3 x8 Half-length card
- 4GB onboard video cache
- Flexible machine I/O:
  - 4 TTL configurable I/Os
  - 4 LVCMOS configurable I/Os
  - 4 LVDS inputs and outputs
  - 4 opto-isolated inputs and outputs
  - 4 quadrature rotary encoders
  - 4 timers
  - Integrated strobe controller
- Optical interface
- Transfer rates of up to 55 Gbps through PCIe and up to 40 Gbps through optical interfaces
- CWDM support
- Authentication device for design security
- Temperature control
- Fan control
- GUI Interface
- Supporting Windows and Linux OS
- API for custom application development
- Plug-in modules for Matlab HALCON Cognex and Labview
- Gen<i>Cam compliant
- GenTL support
- 4 indication LEDs
- 0°C to 55°C operating environment temperatures

Technical Data

Feature	
Form Factor	PCI Express card
Format	Standard profile, half length, 8-lane PCI Express card
Cooling method	Air cooling, fan-cooled heatsink (Optional passive heatsink)
Mounting	For insertion in a standard height, 8-lane or higher, PCI Express card slot
Connectors	▪ 4x SFP+ connectors ▪ 1x Internal I/O connector: 26-pin 2-row 0.1" pitch pin header with shrouding for I/O lines
Dimensions	167.65 mm x 111.15 mm | 6.6 in. x 4.38 in. (Length x Height)
Weight	225gr

Host bus	
Standard	PCI Express 3.0
Link width	8 lanes, 1, 2 or 4 lanes with reduced performance
Link speed	▪ 8.0 GT/s (PCIe 3.0) ▪ 5.0 GT/s (PCIe 2.0) with reduced performance
Maximum payload size	512 bytes
DMA	▪ 32- and 64-bit ▪ Scatter gather support ▪ Physical address support (GPU transfers)
Peak delivery bandwidth	7,880 MB/s
Effective (sustained), delivery bandwidth	6,710 MB/s (Host PC motherboard dependent)
Power consumption	Typ. 16.8 W (3.8 W @ +3.3V, 13 W @ +12V), excluding camera and I/O power output

Camera / video inputs	
Interface standard(s)	Camera Link HS X 1.0 protocol
Status LEDs	▪ 1 bicolor status LED per connector ▪ 4 System status LEDs
Number of cameras	Up to 4
Number of links, per single camera	Up to 4
Synchronization between cameras	Yes
Line-scan cameras supported	Yes
MAX aggregated camera data transfer rate	40 Gbit/s
MAX processed data transfer rate	55 Gbit/s
Camera types	▪ Area-scan cameras: - Gray-scale and color (RGB and Bayer CFA) - Single-tap (1X-1Y) progressive-scan (Row partitioning on multi cable) ▪ Line-scan cameras: - Gray-scale and color RGB
Camera pixel formats supported	Raw, Monochrome, Bayer, RGB, YUV, YCbCr and RGBA (PFNC names): - Raw - Mono8, Mono10, Mono12, Mono14, Mono16

	- BayerXX8, BayerXX10, BayerXX12, BayerXX14, BayerXX16 Where XX = GR, RG, GB, or BG - RGB8, RGB10, RGB12, RGB14, RGB16 - YUV411_8, YUV411_10, YUV411_12, YUV411_14, YUV411_16 - YUV422_8, YUV422_10, YUV422_12, YUV422_14, YUV422_16 - YUV444_8, YUV444_10, YUV444_12, YUV444_14, YUV444_16 - YCbCr601_411_8, YCbCr601_411_10, YCbCr601_411_12, YCbCr601_411_14, YCbCr601_411_16 - YCbCr601_422_8, YCbCr601_422_10, YCbCr601_422_12, YCbCr601_422_14, YCbCr601_422_16 - YCbCr601_444_8, YCbCr601_444_10, YCbCr601_444_12, YCbCr601_444_14, YCbCr601_444_16
Area-scan camera control	
Trigger	▪ Precise control of asynchronous reset cameras, with exposure control. ▪ Support of camera exposure/readout overlap. ▪ Support of triggering from encoder or timer. ▪ Support of external hardware trigger, with optional delay, filtering and trigger decimation.
Strobe	Accurate control of the strobe position for strobe light sources. Support of early and late strobe pulses.
Line-scan camera control	
Scan/page trigger	▪ Precise control of start-of-scan and end-of-scan triggers. ▪ Support of external hardware trigger, with optional delay and filtering. ▪ Support of triggering from encoder. ▪ Support of infinite acquisition, without missing lines.
Line trigger	Support for quadrature motion encoders, with programmable filters, selection of acquisition direction and backward motion compensation.
Line strobe	Accurate control of the strobe position for strobe light sources.
On-board processing	
On-board memory	Up to 4GByte DDR4 SODIMM
Bayer De-Mosaic	▪ Full 16bit resolution ▪ Bilinear 3x3 ▪ Bilinear 3x2 for linescan with gradient correction
Color Transformation	Full 16bit resolution 18bit coefficients table: - Color space conversion - Gain and Offset
Decimation	Line skip
Additional features	Unpacking of 10-/12-/14-bit to 16-bit with justification to LSB
Frame Timestamp	64bit with 8ns precision
Data stream statistics	Measurement of: - Frame/Line rate - CRC Errors - Dropped frames - Received packets - Test packets
Event signaling and counting	The application software can be notified of the occurrence of various events: - Newly acquired buffers - Camera and Illumination control events - I/O events - Timer events - Encoder events

General Purpose Inputs and Outputs	
Number of lines	▪ 20 I/O lines: ▪ 2 differential inputs ▪ 2 differential outputs ▪ 4 singled-ended TTL inputs/outputs ▪ 4 singled-ended LVTTL inputs/outputs ▪ 4 opto-isolated inputs ▪ 4 opto-isolated outputs
Usage	▪ Any System I/O input lines can be connected to any I/O line ▪ Any I/O line can be used to decode A/B and Z signals of a motion encoder ▪ Any I/O line can generate any trigger event ▪ Any I/O line can trigger a timer
Electrical specifications	▪ Differential lines - LVDS compatible ▪ TTL lines - 5V TTL compliant ▪ LVTTL lines - 3.3V LVTTL compliant ▪ Isolated lines - opto isolated lines with voltage range up to 30V
Filter control	▪ Glitch removal filter available on all System I/O input lines ▪ Configurable filter time constants: ▪ for DIN and TTLIO lines: 50 ns, 100 ns, 200 ns, 500 ns,1 µs ▪ for IIN lines: 500 ns, 1 µs, 2 µs, 5 µs, 10 µs
Polarity control	Yes
Encoders	▪ 4 quadrature encoders with A/B and Z inputs ▪ 32bit position counter ▪ Forward and backward counting ▪ Position trigger support ▪ Noise filtering
Timers	▪ 4 general purpose timers ▪ Configurable delay and duration ▪ 32bit accumulator
Event reporting	▪ 64-bit system timestamp event reporting ▪ Each I/O line can generate event on configurable edge ▪ Each Timer can generate event ▪ Each encoder can generate event

Frame Grabber synchronization	
Synchronization	Precise area and line-scan cameras synchronization across different frame grabbers

Software	
Host PC Operating System	▪ Microsoft Windows 10 32-bit and 64-bit versions ▪ Open source kernel driver ▪ Tested and precompiled for Ubuntu 18.04, RedHat 7.x, CentOS 7.x 64-bit versions ▪ Nvidia Xavier AGX
Buffer management	▪ Circular buffer support ▪ Accumulation of several frames/lines to single buffer to reduce ▪ CPU load ▪ DMA Buffer filling directly to system memory
Gen<i>Cam	▪ Support of Gen<i>Cam 2.4 and 3.0 ▪ Full camera and frame grabber parameters configuration
GUI	▪ Supported for Windows and Linux OS ▪ Multi camera display and configuration ▪ Flexible buffer queuing ▪ Image/video recording and playback
Debugging capabilities	▪ Event logging

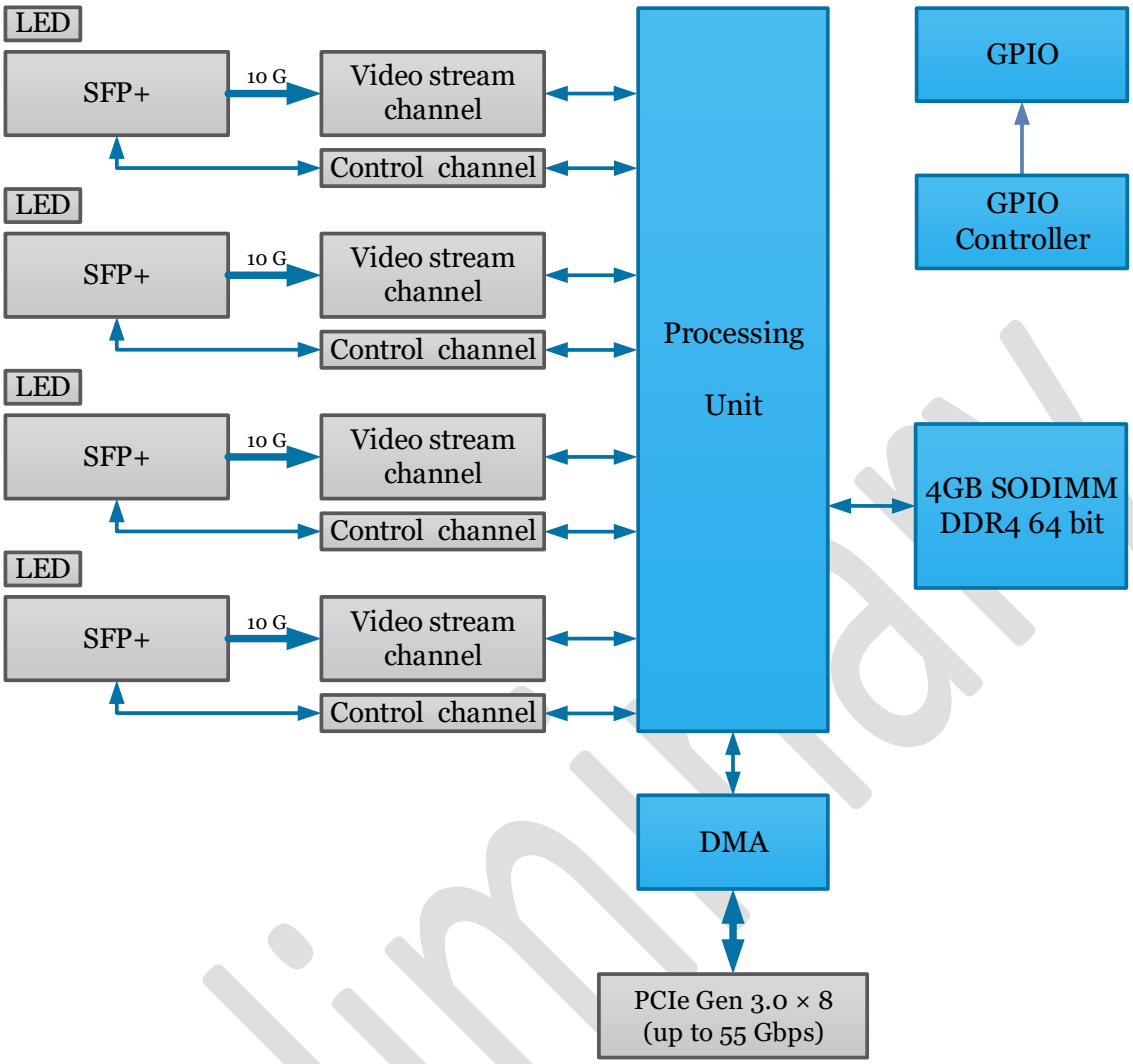
	▪ Statistics counters
APIs	▪ Gen<i>Cam GenTL producer libraries C, Python and .NET bindings ▪ Compilers: x86 and x86_64 dynamic library designed to be used with ISO-compliant C runtime Allows for development of x86 and x86_64 applications ▪ Plug-in modules for Matlab, HALCON, Cognex and Labview

Environmental conditions	
Operating ambient air temperature	0°C to +50°C / +32°F to +122 °F
Operating ambient air humidity	10% to 90% RH non-condensing
Storage ambient air temperature	-20°C to +70°C / -4°F to +158°F
Storage ambient air humidity	10% to 90% RH non-condensing

Certifications	
Electromagnetic - EMC standards	▪ The European Council EMC Directive 2004/108/EC ▪ The Unites States FCC rule 47 CFR 15
EMC - Emission	▪ EN 55022:2010 Class B ▪ FCC 47 Part 15 Class B
EMC - Immunity	▪ EN 55024:2010 Class B ▪ EN 61000-4-3 ▪ EN 61000-4-4 ▪ EN 61000-4-6
Flammability	PCB compliant with UL 94 V-0
RoHS	Compliant with the European Union Directive 2011/65/EU (ROHS2)
REACH	Compliant with the European Union Regulation No 1907/2006
WEEE	Must be disposed of separately from normal household waste and must be recycled according to local regulations

Ordering Information	**KY-FGF-II-CLHS**
Optional accessories	▪ SFP+ modules ▪ Fiber cables ▪ GPIO expansion bracket

Komodo II CLHS Frame Grabber HW Block Diagram



Compatibility

KAYA Instruments creates and maintains compatibility and interfaces for the most common and advanced vision image processing libraries and applications. Major support is available for **MVTec Halcon, National Instruments' LabVIEW** and **MathWorks' MATLAB**.

- Supported vision standards:

CoaXPress® GEN<i>CAM TRANSPORT LAYER 10GiGE VISION GEN TL CAMERA Link HS

- Supported vision libraries:

HALCON a product of MVTec OpenCV NATIONAL INSTRUMENTS LabVIEW COGNEX

- Supported operating systems:

Windows Linux

Please check our website for an up-to-date list of other supported libraries and software package

Contact Us

International Distributors

Sky Blue Microsystems GmbH
Geisenhausenerstr. 18
81379 Munich, Germany
+49 89 780 2970, info@skyblue.de
www.skyblue.de

In Great Britain:
Zerif Technologies Ltd.
Winnington House, 2 Woodberry Grove
Finchley, London N12 0DR
+44 115 855 7883, info@zerif.co.uk
www.zerif.co.uk